Joint DESY and University of Hamburg Accelerator Physics Seminar

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(16:00 in Room 459/30b)

Design of and Some Experimental Research on the Higher Harmonic Cavity for SSRF

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Abstract

Shanghai Synchrotron Radiation Facility (SSRF) is an up to date 3-rd generation light source scheduled to run in May of 2009. In order to improve its lifetime and beam instability, a third harmonic cavity is being developed. The research about the harmonic cavity is presented, including the physical design, fabrication techniques and experimental tests.

Concerning design, the mechanism of the harmonic was analyzed. A low dissipation and HOM free cavity is chosen to be the final shape. Based on the single cell cavity, the two–cell scheme with two uncoupled cells and fluted beam pipe was proposed. Much effort has been put into the fabrication of the niobium cavity. Punching–welding method is chosen as the way to a real superconducting cavity. Copper prototype cavities are manufactured too. The precise fundamental mode frequency is achieved.

Two kinds of experiments are made on the cavities after the manufacture. One is the electro–magnetic field mapping and R/Q measurement. The system can be used to measure different modes' electro field on/off cavity axis and automatically calculate the R/Q by the data acquired in the field mapping process. The copper 1.5GHz harmonic cavity's HOMs are measured, the results accord with the simulations well. The other experiment is the vertical test. No surface treatment has been done before the test, the niobium cavity's quality factor reaches more than 5E+7 at the acceleration field of 1.07MV/m. The welding is also proved to be acceptable because the vacuum in the cavity can reach ultra-high-vacuum.

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